

Potential Climate Change Impacts to Industry and Municipal Water Users

Jon W. Bloemker, Ph.D., P.E.

Michigan Department of
Environmental Quality



Major Issues for Water Users

- Quantity of Water
- Quality of Water
- Infrastructure
- Costs
- Legal & Political Restrictions



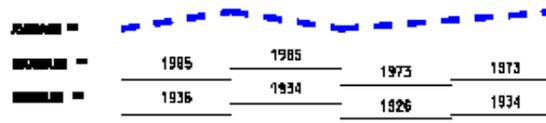
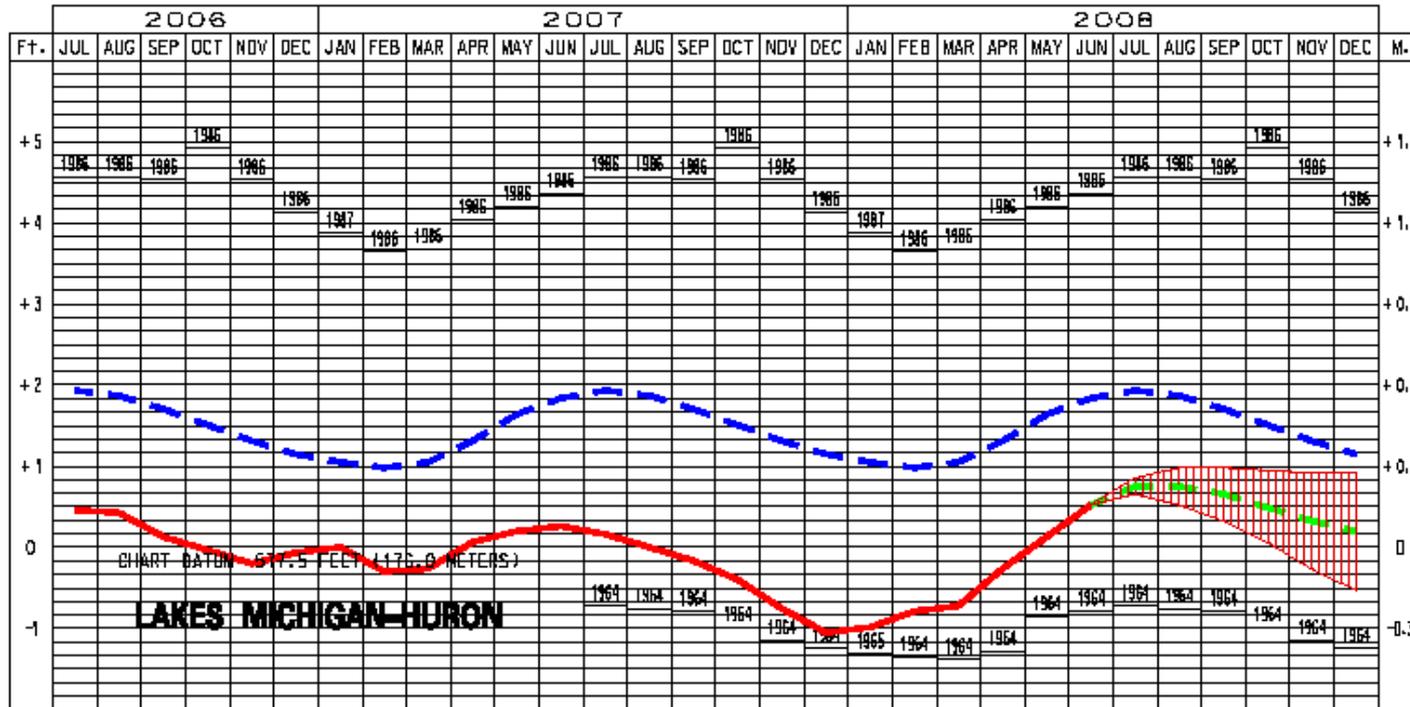
Traditional Assistance

- American Water Works Association
- U.S. EPA
- Various Manufacturers
- NOAA



Lake Levels Versus Capacity

LAKES MICHIGAN-HURON WATER LEVELS - JULY 2008

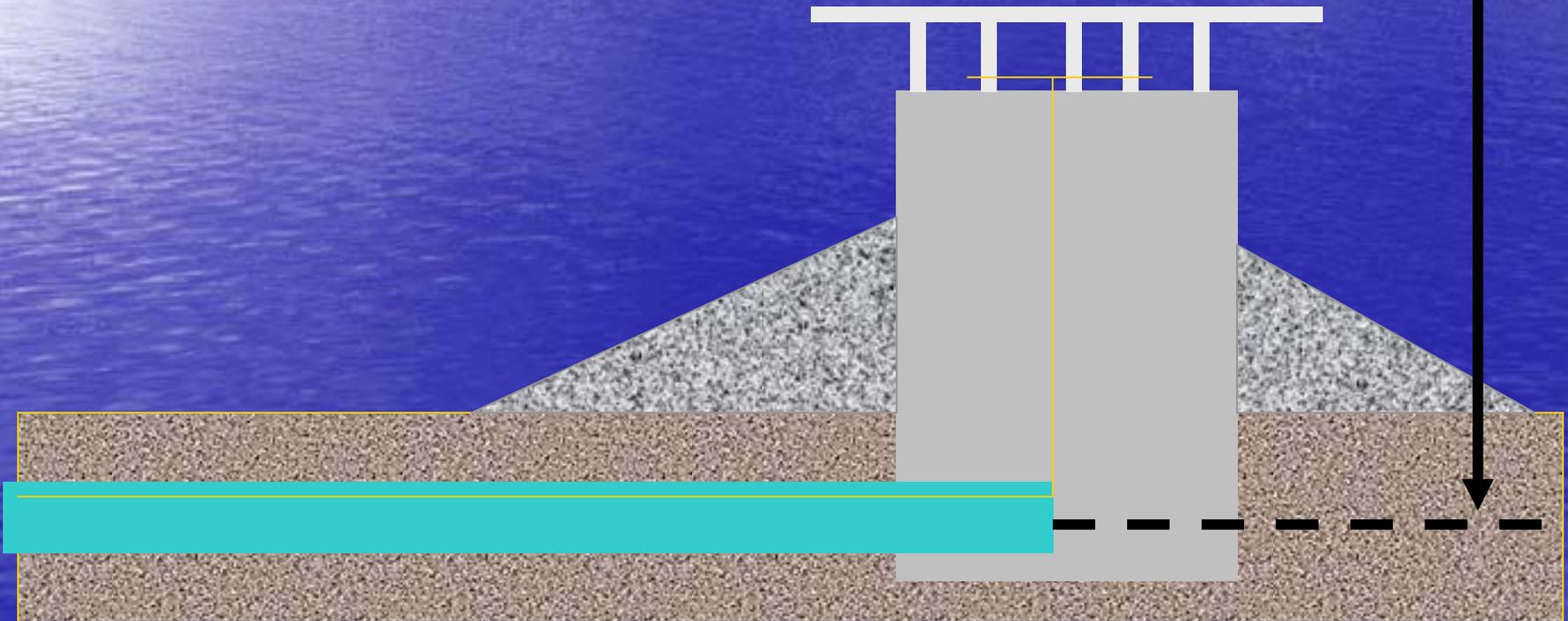


††† Average, Maximum and Minimum for period 1918-2007

Surface Water Intakes

WL

Lower Levels = Less Capacity



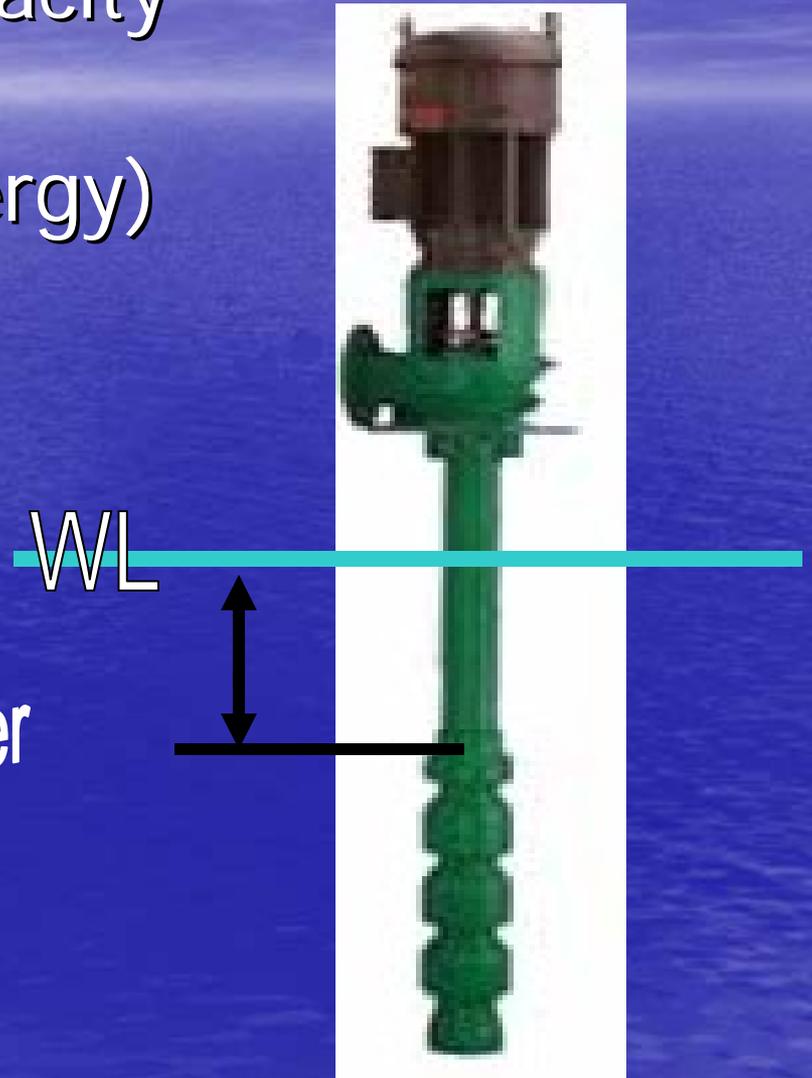
Pumps

Lower Levels = Less Capacity

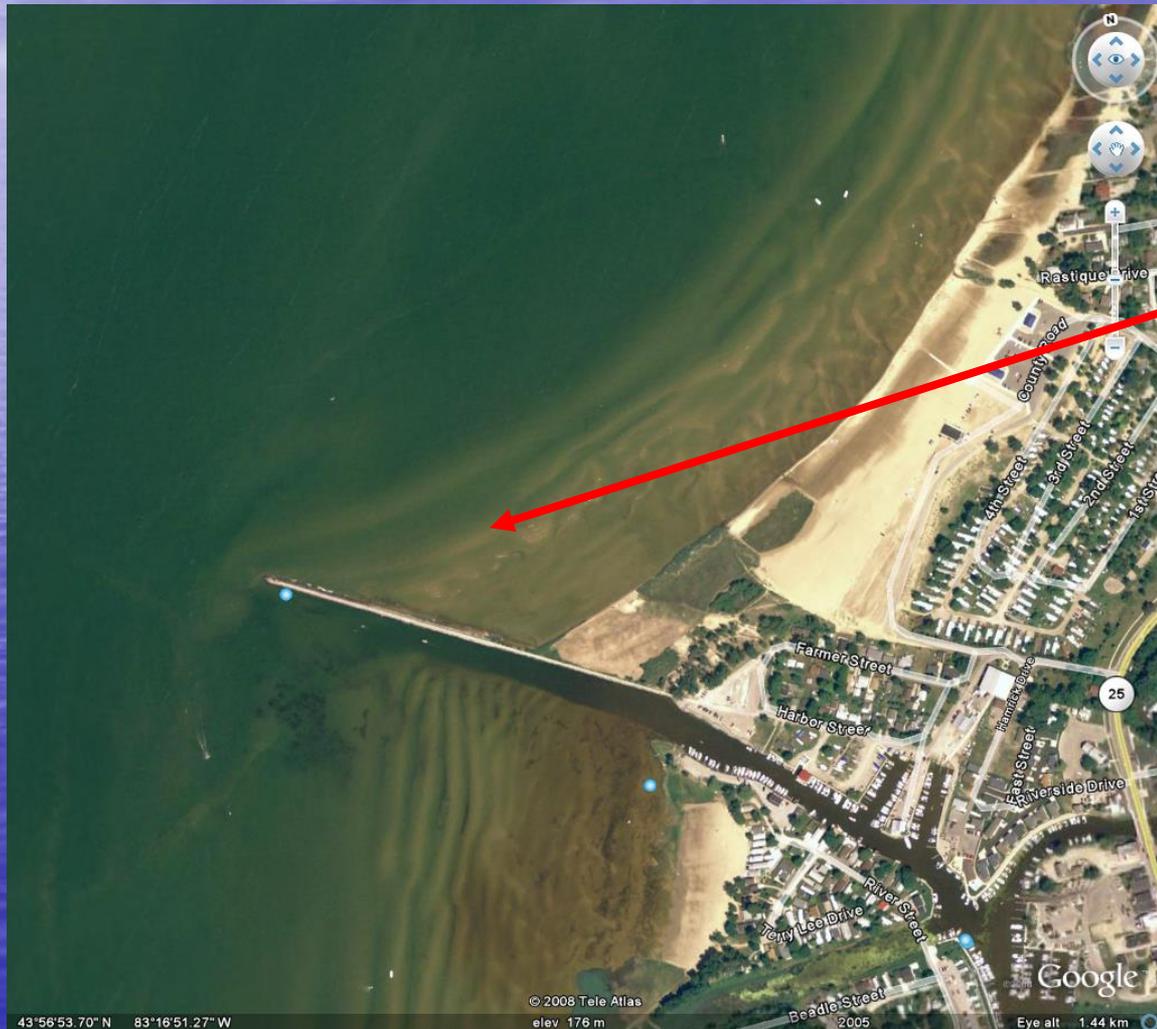
Less Available Head (Energy)

& Higher Pumping Costs

WL drops too low, no water



Changes to Sedimentation Pattern



Intake Location

Changes to Sedimentation Pattern

- Added or diminished cover for lines crossing streams? Also, channel and harbor dredging becomes a major issue.



Potential Water Quality Changes

- Temperature
- D.O.
- Total Suspended Solids
- Turbidity
- Salinity
- Disinfection Byproduct Precursors
- Total Organic Carbon
- Corrosivity
- Taste & Odor
- Color
- Plankton & Algae Changes



Potential Water Quality Changes

- Difficulties with Federal Regulations
 - DBPR Stage 2 Rule
 - Lead and Copper Rule
 - Long Term 2 Surface Water Treatment Rule
 - Total Coliform Rule



Potential Water Quality Changes

- Increased Temperatures
 - Increased corrosion rates
 - Lead & copper
 - Increased DBPR formation potential
 - TTHMs & HAA5
 - Bacteria Regrowth Increase
 - Drinking water not sterile
 - Disinfectant residuals decrease
 - Change in nature of turbidity
 - Biological &/or organic versus inorganic
 - Settling Rates

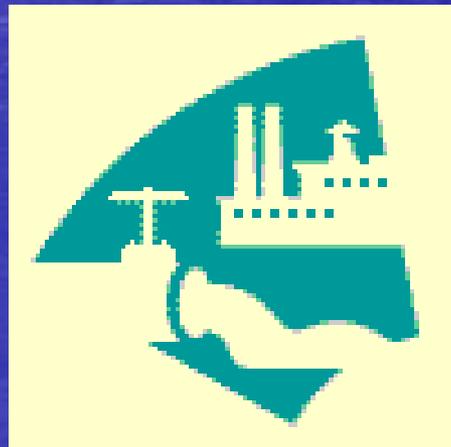
Quality Changes Due to Depth & Other Contributing Issues



Attached Algae Growth

Water Quality for Dischargers

- Total Daily Maximum Loadings (TDMLs)
 - Lowered due to less flows
 - Lowered due to water quality changes
- Lower Discharge Limits



Mixing Zones

Costs

- Pumping Cost Increases
 - Associated w/ Electrical Rates
 - Changes to Customer Water Demands
 - Changes to Raw Water Levels



Costs

- Treatment Costs
 - In past year, over 30% increases in chemical costs?
 - Further increases due to more demands for same resources?
 - Additional increases due to higher dosages?



Soil/Ground Shrinkage



- Shrinkage caused by reduced soil moisture
 - Especially clay
- Increased stresses on buried lines
 - Breaks increase
 - Joint separation

Legal & Political Issues

- Water withdraw legislation & permits
- Obtaining new right-of-ways
- Acquiring land
- Bonding



Legal & Political Issues

- Past & present
 - Out of sight & out of mind
 - Unwillingness to invest in infrastructure



Increased System Demands

- Correlation between Temperatures, Precipitation and Pumpages
- System Growth/Expansion
- Increased Wear & Tear on Infrastructure (Things do wear out)



Biased Conclusion

- Problems not insurmountable
- Solutions will require more money
- Political will for solutions and investments questionable!

